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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/982,595	10/18/2001	Chong Chin Hui	TI-27874	7591
23494	7590	03/24/2004	EXAMINER	
TEXAS INSTRUMENTS INCORPORATED P O BOX 655474, M/S 3999 DALLAS, TX 75265			PAREKH, NITIN	
			ART UNIT	PAPER NUMBER

2811

DATE MAILED: 03/24/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/982,595

Applicant(s)

HUI ET AL.

OK

Examiner

Nitin Parekh

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— The MAILING DATE of this communication appears on the cover sheet with the correspondence address —

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 21 January 2004.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1,3,4,8 and 9 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,3,4,8 and 9 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 18 October 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. §§ 119 and 120

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☒ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
- a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other.

## **DETAILED ACTION**

### ***Request for Continued Examination***

1. A request for continued examination (RCE) under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 01/21/04 has been entered. An action on the RCE follows.
2. The amendment filed on 12/08/2003 has been entered.

### ***Claim Rejections - 35 USC § 102***

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

4. Claim 8 is rejected under 35 U.S.C. 102(a) as being anticipated by Uemura (US Pat. 6016003).

Regarding claim 8, Uemura discloses a die island/pad (11 in Fig. 1) for an IC having an IC chip/die (1 in Fig. 1), the die island/pad comprising:

- a support portion (not numerically referenced-see shaded area under the IC die including 11 and portions of the support bar in Fig. 1) for supporting the IC

chip/die (see Fig. 1), the support portion supporting substantially all of the IC chip/die, except corner portions of the chip/die are not supported by the support portion (see corner regions of 1 in Fig. 1), and

- the support portion of the die island/pad having a cross shape under the IC chip/die resulting from the support portion having rectangular cutouts below the corner regions (see rectangular cutouts/dents and the shape of the support portion in Fig. 1)

(Fig 1; Col. 1, lines 10-33).

### ***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 1, 3 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hollingsworth et al. (US Pat. 5521428).

Regarding claim 1, Hollingsworth et al. disclose a die support structure having an integrated circuit (IC) die (65 in Fig. 6), the die support structure comprising a variety of die support configurations comprising:

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- a plurality of die support/tie bar support regions including four separate and isolated die support regions/tie bar support regions (63 in Fig. 6), each die support /tie bar support region being under one of the corners of the IC die (see regions 63 overlapping 65 in Fig. 6), and
- the separated die support/tie bar support regions being in contact/bonded with the IC die (Col. 4, line 57) and providing a reduced plastic/metal interface area to reduce delamination and stress/cracking related defects (Col. 6, line 5-65).

(Fig 6; Col. 6, line 25- 37; Col. 3-7).

Hollingsworth et al. fail to specify/designate the die support regions being the die pad regions.

Hollingsworth et al. further teach the support regions of the die support configuration providing a function of supporting the die or the dice having different sizes (Col. 3, lines 20-25).

It would have been obvious to a person of ordinary skill in the art at the time invention was made to incorporate four separate die support regions so that the delamination, void formation and stress/cracking related encapsulation defects can be reduced in Hollingsworth et al's die support structure.

Regarding claims 3 and 4, Hollingsworth et al. teach substantially the entire claimed structure as applied to claim 1 above, except ratio of the total area of the die pad regions to the die being in a range of about 0.3-0.5 or 0.32 respectively.

Hollingsworth et al. further teach selecting a variety of configurations for the die support regions having different shapes and sizes such as U-shape, H-shape, T-shape, segments having rounded edges, etc. to further reduce stress, improve support and to accommodate various die sizes/dimensions in the encapsulated package (Col. 6, line 25-47).

Furthermore, determination of parameters such as die support area, number of die support regions, thickness of the die pad/metal support, area ratio of die to die pad support region, number of bonding wires/leads, encapsulant thickness, etc. and their effect the encapsulation defects such as delamination, void formation, cracking, etc. in chip packaging and encapsulation technology art is a subject of routine experimentation and optimization to achieve the desired yield and reliability.

It would have been obvious to a person of ordinary skill in the art at the time invention was made to arrive at the ratio of the total area of the die pad regions to the die being in the range of about 0.3-0.5 or 0.32 so that delamination, void formation and stress/cracking related defects can be reduced in Hollingsworth et al's die support structure.

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7. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Uemura (US Pat. 6016003) in view of Hollingsworth et al. (US Pat. 5521428).

Regarding claim 9, Uemura teaches substantially the entire claimed structure as applied to claim 8 above, except a ratio of the area of the support portion of the die pad to the area of the die being in a range of about 0.3-0.5.

Hollingsworth et al. further teach selecting a variety of configurations for the die support regions having different shapes and sizes such as U-shape, H-shape, T-shape, segments having rounded edges, etc. to further reduce stress, improve support and to accommodate various die sizes/dimensions in the encapsulated package (Col. 6, line 25-47).

Furthermore, determination of parameters such as die support area, number of die support regions, thickness of the die pad/metal support, area ratio of die to die pad support region, number of bonding wires/leads, encapsulant thickness, etc. and their effect the encapsulation defects such as delamination, void formation, cracking, etc. in chip packaging and encapsulation technology art is a subject of routine experimentation and optimization to achieve the desired yield and reliability.

It would have been obvious to a person of ordinary skill in the art at the time invention was made to arrive at the ratio of the total area of the die pad regions to the die being in the range of about 0.3-0.5 as taught by Hollingsworth et al so that

delamination, void formation and stress/cracking related defects can be reduced in Uemura's die support structure.

***Response to Arguments***

8. Applicant's arguments filed on 01-21-03 have been fully considered but they are not persuasive.

A. Applicant contends that Hollingsworth et al. teach four separate raised structures and not the die pad/support regions.

However, as clearly shown in Fig. 6 of Hollingsworth et al., the four separate and isolated regions (63 in Fig. 6) of the tie bar/support structure provide the function of the die support/die pad, and furthermore the chip is supported/bonded on those four support regions of the die support structure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nitin Parekh whose telephone number is 571-272-1663. The examiner can normally be reached on 09:00AM-05:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Lee can be reached on 571-272-1732. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9318.



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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

NP

03-17-04



NITIN PAREKH

PATENT EXAMINER

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